Magazine appears correspondence on this subject by Dr. Rambaut, myself, and others, and the editor, Dr. Mill, in summing up the matter, decided strongly in favour of the dispersion theory. Capt. Carpenter, R.N., whose numerous observations appear in the *British Astron. Assoc. Journal*, holds the same view.

It is quite true that, if I look steadily at a bright red sun, and then close my eyes, I see a green after-image, but this is just what the observer of the green flash should not do. He should avoid looking at the sun when it is bright, and should wait until it is so low that the eye can easily bear the light—should wait, in fact, until only a very small segment is visible. As before stated, with a really red sun the flash fails to appear, so far as my experience goes. If proper precautions are taken I do not think any appreciable after-image will be present.

I may point out that the nature of the horizon, provided it is clean-cut and low down, makes but little difference. It may be of cloud, land, or water, and, of course, the last is the best. My experience relates to all three.

But few persons appear to have used a telescope for observing the flash. If those who have not done so would observe a low sun with a power of, say, 100, I think that they would be convinced that the true cause was atmospheric dispersion.

The real mystery about the flash is that it so often fails to appear, when apparently all conditions seem favourable. I have not yet found any explanation of this, but I am inclined to the opinion that at a clear sunset the flash could always be seen if a telescope were available, though it might be too feeble for the naked eye, for a telescope invariably reveals the upper green fringe when the sun is low. The telescope, of course, was achromatic, and showed no colour with a high sun. To the Journal of the B.A.A., to that of the Leeds Astron. Society, and to the *English Mechanic* I have contributed very numerous notes on this subject, but references to them would occupy too much of your valuable space. C. T. WHITMELL.

Invermay, Hyde Park, Leeds, February 22.

The Prices of Chemicals.

I HAVE had the same experience as "S. P." Since my letter of February 18 I have been able to purchase dulcite at 60*s.* an ounce from a firm of dealers in chemicals other than the one to which I referred. I cannot admit, therefore, that my complaint was unjustifiable. J. J.

University of Liverpool, March 2.

THROUGH SIBERIA.[1]

THIS book is the diary of a very interesting journey accomplished by the author in the course of the autumn of 1913. In fact, it describes four different journeys: one from Tromsö, *via* the Kara Sea, to the mouth of the Yenisei; then up the Yenisei to Krasnoyársk; next by rail across Transbaikalia and Manchuria to Vladivostók on the Pacific; and from this port to Petrográd, by the Usuri and the new Amur railway and the main Trans-Siberian line. A remarkable feature of this journey, during which more than 16,000 miles were covered, is that it was accomplished in less than three months, from August 5, when the party started from Tromsö, to October 27, when Dr. Nansen reached Petrográd.

We cannot expect to find detailed descriptions of the different portions of the immense continent thus rapidly crossed; but the book throughout has the greatest interest, owing to the human element it contains, and the unexpected glimpses it gives of the Canada of the East, with its wonderful development during the last fifteen years. In addition, it is illustrated by more than 160 beautiful photographs, taken by the author himself, most of which are worth pages of descriptions. The ethnographical remarks about the northern natives, whose encampments, or boats, Dr. Nansen always found time to visit, especially about the remaining members of that curious, once numerous, nation, the Yenisei Ostyáks, will be read with a special interest; while the photographs, as may be seen from the two accompanying specimens, give a clear idea of the ethnographical types of the different native tribes.

The really difficult part of the journey, from Tromsö to the mouth of the Yenisei, was made on the steamer *Correct*, with the experienced pilot Capt. Johannsen, without meeting with serious difficulties. There was a good deal of ice in the Kara Strait, and especially further east, so that the *Correct* had to enter the Kara Bay in order to follow the narrow, more or less ice-free channel close to the coast of the Yalmal peninsula. There was only one dangerous accident, when the steamer stuck on a mud bank close by the Devil's Island; but otherwise the journey was quite successful, and it took only eighteen days from the day the steamer entered the Kara Strait to the day it reached the port at Nosónovskiye Islands, in the Yenisei, under the 71st degree of latitude.

Once more the practicability of the northern route to Siberia was thus demonstrated. But it must be said that the conditions of ice along the northern coast of Siberia show great variations in different years, and in 1913 they certainly were by far not so favourable as they were in the years 1870–1871 and 1875–1878. A very valuable appendix, where the average summer temperatures on the shores of the Kara Sea and the conditions of ice in that sea are given for the last forty-one years, shows that while this passage was remarkably free from ice in the years named, as well as in 1890, 1897, 1900, 1901, and 1904, the conditions were not favourable for navigation in 1883, 1884, 1888, 1911, and 1913, unfavourable in 1895 and 1902, and most unfavourable in 1903 and 1912.

Still, Dr. Nansen is certain that the northern route may become a regular line of traffic if certain measures are taken. During his journey up the Yenisei, and later on along the Trans-Siberian railway, he had full opportunities to discuss such measures with M. Vl strótin, a Russian merchant and member of the Duma who has great knowledge of the Siberian north, and also made the journey on the *Correct*, and

[1] "Through Siberia, the Land of the Future." By Dr. F. Nansen. Translated by A. G. Chater. Pp. xvi+478. (London: W. Heinemann 1914.) Price 15*s.* net.

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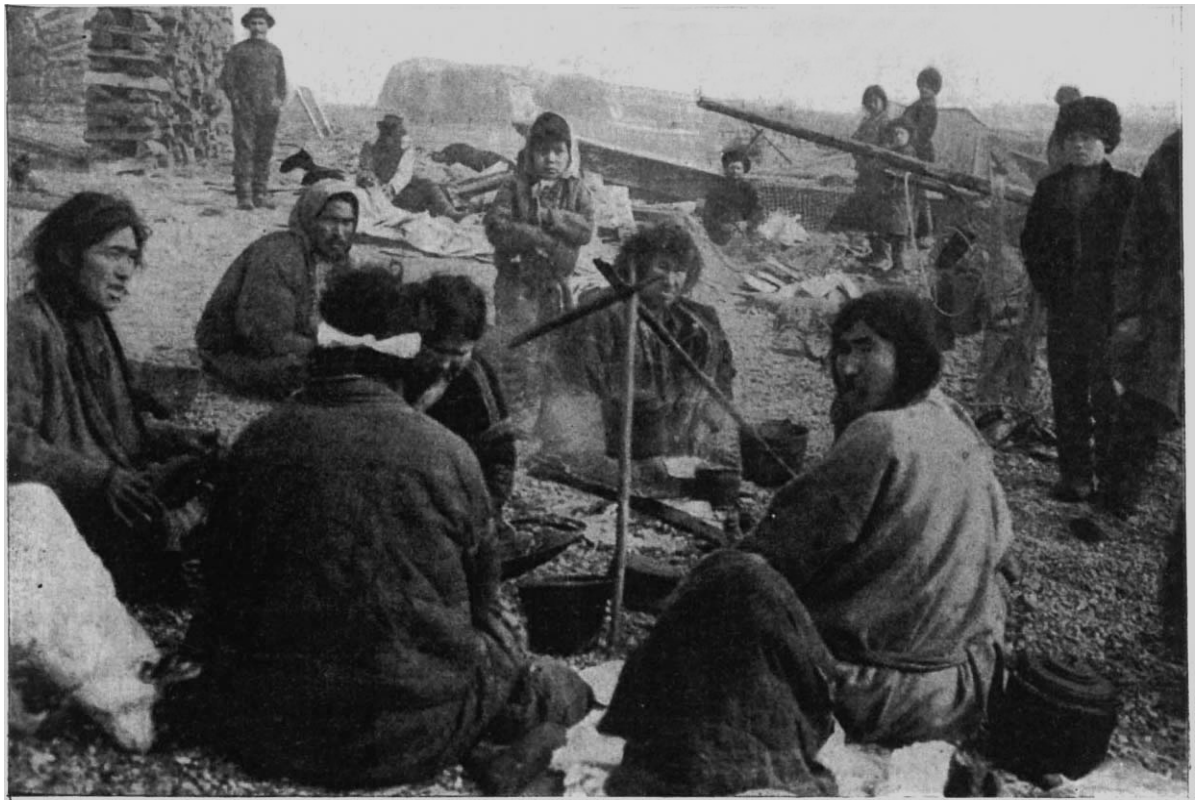
M. Wourtzel, the head of the traffic on the Siberian railway.

"We had," Dr. Nansen writes, "great deliberations in the saloon [of the train] as to how the trade route between Norway and the Yenisei could be best secured, and what were the first steps to be taken to this end. We discussed the best arrangement of wireless stations, the dispatch of motor sloops to investigate the extent of the ice in the Kara Sea, how aeroplanes might be used for constantly reconnoitring the ice-conditions of the sea, in connection with the wireless stations, and so on. The construction of an efficient harbour for discharging and loading in the northern part of the Yenisei and the transport up and down the river were discussed with Vostrótin, who has these questions at his fingers' ends. By native huts to Krasnoyársk, with its gilded cathedral, public park, museum, schools, and electric light in the streets—all the town profusely illuminated to welcome the Norwegian guest—all this, most sympathetically told by Nansen, is fascinating reading.

At Krasnoyársk Dr. Nansen took the luxurious eastern train which brought him in four days, from September 29 to October 4, to Vladivostók on the Pacific. Notwithstanding the rapidity of this journey, we still find in Dr. Nansen's book very interesting remarks about the condition of Siberia, the causes of its slow colonisation, and the rapid strides it has made since the Manchurian war.



Group of Yenisei-Ostyáks. From "Through Siberia." By Dr. F. Nansen. (London: W. Heinemann.)
(The figures in the background, left and right, are Russians.)

degrees a whole programme was drawn up under the shrewd guidance of Wourtzel."

The journey up the Yenisei to the town Yeniseisk, made in a little motor steamer, *Omul*, offered Dr. Nansen the opportunity of making many fine remarks about a variety of subjects—Baer's law of excavation of the right banks of rivers; the first appearance of larches; the exiles scattered even within the Arctic circle and living in tiny primitive huts, the first appearance of agriculture and cattle-breeding, and so on. The rapid change on this journey, from the endless treeless *tundra* to the thick forests region, the gradual growth of the clusters of "snug, low timber buildings," into villages, and further south into towns, and the transition from the isolated

Winter was rapidly setting in, and next day Dr. Nansen had already begun his return journey—this time on the railway which runs down the valley of the Usuri to the new town of Khabarósvk, which I knew fifty years ago as a village of a score of houses. The great railway which is now built by the Russian Government along the left bank of the Amur had not yet reached this new capital of the Lower Amur region. An immense bridge, 7827 ft. long, on nineteen piles, is being built below Khabarósvk across the Amur; and this bridge, as well as the lowlands on the left bank, representing an immense swamp for some 200 or 300 miles, often inundated during the monsoon rains, offer great difficulties to the engineers. The journey across this marshy

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region, as well as the crossing of the Little Khingán, were made by Dr. Nansen, partly in horse carriages, partly in trolleys run along temporary rails, and partly in a motor-car, until he reached, on the Zéya plain, about 420 miles from Khabarósvk, a station where he could take the direct train to Petrográd. This station, from which Dr. Nansen could now travel by rail all the way to Petrográd, with but one or two interruptions at unfinished bridges, received from the local engineers the name of "Nansen's."

On October 18 Nansen was at Chitá, where he joined the Eastern Express. He passed Irkútsk at night, without stopping; six days later he was

Men and women of the Yuraks and Yenisei Samoyedes. From "Through Siberia." By Dr. F. Nansen. (London: W. Heinemann.)

in the Urals, and on October 27 he reached Petrográd; and yet, notwithstanding the rapidity of the journey, his observations and remarks about Siberia, "the land of the future," "Russia in the East," and "The Yellow Question," and so on, are both valuable and interesting.

The book is richly produced, with numerous excellent reproductions of Dr. Nansen's photographs, and with three maps—one of the Kara Sea and adjoining lands, and two of Siberia. The transcription of Russian names, both in the text and on the maps, is quite correct, with the exception of a very few words, in which the German spelling has been followed (Tas, Seya, Syriansky, instead of Taz, Zeya, Zyriansky).

P. KROPOTKIN.

A BIOLOGICAL PUZZLE.[1]

DR. BRUN, of Zürich, has done a fine piece of work in devising an elaborate and ingenious series of experiments which enable us to come to a decision among the rival theories of way-finding among ants. Let us first illustrate the facts. If we pick up one of the higher ants from an ant-road, turn it about in a box, and then empty it out again near the place of its capture, it makes no mistake in hurrying homewards. When an ant goes off alone on an exploring adventure, it often keeps persistently in one general direction, in spite of many divagations to one side or the other, and when it turns its face homewards, it does not usually retrace its steps, but pursues a parallel course until it comes near the nest. If a higher ant, such as *Formica rufa,* be gently but firmly induced to travel on a path chosen for it and not by it, it makes straight for home when freed from coercion. It may run along a line which is the hypotenuse of the triangle the other two sides of which it was compelled to follow, or it may complete a polygonal figure and reach the nest. If members of such species as *Formica rufa* and *F. sanguinea* be lifted up and carried some distance and put down in hunting ground which they have

[1] "Die Raumorientierung der Ameisen und das Orientierungsproblem im allgemeinen. Eine kritisch-experimentelle Studie; zugleich ein Beitrag zur Theorie der Mneme." By Dr. Rudolf Brun. Pp. viii+234+51 figs. (Jena: Gustav Fischer, 1914.) Price 6 marks.

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